**PHASE Space Measurements (PHASMA) Experiment**

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**PLANNED INITIAL EXPERIMENTS**

**Proto Thermal Anode/Strap Drive Instabilities**

**Magnetic Field System**

- **Electron Scattering Ring System (ESRS)**: Used to generate large magnetic field gradients near the beam entry. The magnetic field is typically turned off in the central vacuum chamber.
- **Helicon Source Capabilities**: Used to generate a dense plasma for measurements in the central vacuum chamber. The collisionality can be adjusted by changing the input power and the gas pressure.
- **Diagnostic Systems**: Used to measure the plasma properties, such as electron temperature, density, and velocity.

**Magnetically Confining Beams**

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**Recovery Region**

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**Diagnostic/Systems**

**Ion Imaging/Scattering Diagnostics**

- **Universal Ring Imaging System (URIS)**: Used to measure the ion trajectories, allowing for the determination of the magnetic field strength and direction.
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**Abstract**

A new experiment called the PHASE Space Measurements (PHASMA) experiment features laser-induced electron scattering diagnostics for electron collisional distribution function measurements, and a microwave scattering system for turbulence measurements. PHASMA, scheduled for field experiments at MPP in 2003, is designed to enable the study of high-sensitivity plasma diagnostics, including image techniques for electron collisions, turbulence scattering, and microwave scattering. The large enhancement in electron scattering provides exceptionally high electron density measurements, critical for plasma imaging of vortices. The vacuum system for the entire experiment will be maintained at a high density of 5000 ions/cm^3. Each optical system will be mounted on a moving motorized table for 3D linear scans for generating measurement maps across the entire 20 cm scale. Additional diagnostics include the PHASMA thermo-laser technique for electron density, electron temperature, and turbulence. To achieve the necessary conditions for different experimental regimes, PHASMA will employ a 50 cm diameter helium backing chamber, a high-vacuum pump, and a plasma source. The plasma source will be fed with a mixture of noble gases through the vacuum chamber, and the plasma will be controlled by the plasma source. The plasma source will be fed with a mixture of noble gases through the vacuum chamber, and the plasma will be controlled by the plasma source.